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AROMATHERAPY MASSAGE AS AN ALTERNATIVE IN REDUCING CORTISOL LEVEL AND ENHANCING BREASTMILK PRODUCTION ON PRIMIPAROUS POSTPARTUM WOMEN IN SEMARANG

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Less breastmilk production after giving birth was possibly caused by the lack of prolactin and oxytocin hormones stimulation. Physical and emotional stresses contribute on disorder of breastmilk production reflex by the reduction of oxytocin during breastfeeding. Massage can increase milk production by 11.5 times and decrease 28% cortisol levels's whilst aromatherapy massage normally more effective in improving prolactin levels. The research aimed to prove the effect of aromatherapy massage toward cortisol level and breastmilk production of primaparous postpartum women in Semarang**.** Quasi-experimental study with non-equivalent control group design was employed. Sampling was drawn consecutively, make it totally 44 postpartum women were involved. Paired t-test and one way Anova were employed as data analysis. There was an effect of massage, aromatherapy, and aromatherapy massage toward breastmilk production with each p-value = 0.000. Significant differences of breastmilk production occurred among the four groups (p-value = 0,000). Massage, aromatherapy, and aromatherapy massage influenced cortisol level (p-value = 0,004; p value = 0,001; p value = 0,000) and there was a significant effect on cortisol level in four groups (p value = 0,047). Aromatherapy massage was proven in reducing cortisol level and enhancing breastmilk production on primaparous postpartum women in Semarang. Therefore, it is recommended to provide aromatherapy massage to every postpartum women.

Keywords: Massage, Aromatherapy, Aromatherapy Massage, Cortisol Level, Breastmilk Production

1. INTRODUCTION

In order to reduce morbidity and mortality of children, *the United Nations Children's Fund* (UNICEF) and *World Health Organization* (WHO) recommends the baby should be feed only breast milk for at least six months. Solid food should be given when the baby passed six months old, and continued breastfeeding until the child is two years old (WHO, 2005). Health Centers of Semarang reported, of 13,195 infants aged 0-6 months old, only 64 percent were breastfed exclusively in 2014, far below the 80 percent national target (Semarang Public Health Office, 2015).

A decrease in breastmilk production in the first days after birth due to the lack of stimulation of the hormone prolactin and oxytocin was instrumental in lactation. Experimental studies in

breastfeeding mothers have described that acute physical or emotional stress can interfere with breastfeeding reflexes expenditure by reducing the release of oxytocin during breast-feeding (Dewey, 2001). Studies about immune, health and the characteristics of hormonal about women who had experienced postpartum depression showed that mothers who are stressed, tired and negative moods had lower prolactin levels in milk and in serum. Low levels of the hormone prolactin give unfavorable effects on breastmilk production (Groër and Morgan, 2007). Adaptation to stress is regulated by the capacity of hypothalamic-pituitary-adrenal (HPA) to secrete hormones such as cortisol and endorphins. Stress hormones are released in small amounts throughout the day, and when confronted with stress, hormone levels increased dramatically (Lisdiana, 2012). Increased cortisol levels also have an impact on breast milk. The efforts to improve breastmilk production is to increase prolactin and oxytocin hormones and reduce factors that inhibit milk production such as stress.

Massage is often combined with aromatherapy. With using aromatherapy, massage can provides multiple effects. A study shows that salivary cortisol levels were significantly decreased from 4.7 (4.3 to 5.3) ng/ml to 4.4 (3.5 to 4.8) ng/ml when measured about 15 minutes after one aromatherapy massage treatments, as compared to the point in time before treatment (Ji Wu, 2014).

Jasmine oil has a stimulating effect on the nervous system function. Jasmine essential oil can also increase the secretion of breatsmilk from the breast so it is better for the breastfeeding women.[10]*Foeniculum vulgare* or *Fennel* or *Adas* is a plant subtances that gives the galakctogogue effect. A study in Iran reported that the extract of fennel can raise levels of estrogen, progesterone and prolactin serum (Sadeghpour et al, 2015). Efforts to improve maternal and infant health through aromatherapy massage is expected to affect the physical and psychological condition postpartum mothers through mechanism of changes in cortisol levels and increased breastmilk production. This study aims to determine the effect of aromatherapy massage on cortisol levels and breatsmilk production on primiparous postpartum women in Semarang.

2. METHODS

This study employed quasi-experiment with *non-equivalent control group* design. The study was conducted in September-November 2015 in Semarang. The subjects of this study were primiparous postpartum women that fit inclusion criteria, i.e; 1) primiparous postpartum women, 2) normal birth, 3) aged 20-35 years old, 4) history of antenatal care (ANC) at least 4 times in one period of gestation, 5) no abnormalities of the breast, 6) mother breastfeeding on demand, 7) *smoking* should *not* be permitted, 8) drink alcohol should *not* be permitted, 9) consume vitamin / breastfeeding stimulants should *not* be permitted, 10) single baby was born normal, not defective, have the reflexes suction well, given exclusively breastfeed, 11) not allergy essential oil of fennel and jasmine, 12) willing to be a respondent in the study.

Samples was drawn consecutively, make it totally 44 postpartum women were involved and divided into 4 groups with equal numbers (11 persons each). The independent variable in this study are the massage, aromatherapy and aromatherapy massage. The dependent variable are the level of cortisol and breastmilk production, while the confounding variable are the frequency of breastfeeding and Body Mass Index (BMI).

2.1. Measurement of cortisol levels

Cortisol serum levels was measured before (3rd day postpartum) and after the treatment (4th day post partum). Blood sampling performed at 10:00am to 12:00am and measured using reagents.

The DRG Cortisol ELISA (*Enzyme-Linked Immunosorbent Assay*) kit conducted by GAKI Laboratory, Faculty of Medicine University of Diponegoro.

2.2. Measurement of breastmilk production

Measurements of breastmilk production performed by weigh the baby before and after feeding for 24 hours and measuring the amount of breastmilk obtained by milking the breast that is not breastfed. Results of difference babies weighing is converted into units of volume (breastmilk density = 0.04 kg / m^3) (Sinclair, 2010). Measurement of breastmilk production before treatment began on the second postpartum until the third day postpartum, while breastmilk production was measured after treatment began the third day postpartum until the fourth day postpartum.

2.3. Treatment Procedures

The intervention groups received various treatments namely massage in group I, aromatherapy in group II, and aromatherapy massage in group III. The massage group was treated with a full body massage using *sun essential oil* for 45-50 minutes, whilst the aromatherapy group was given aromatherapy oils (Fennel & Jasmine) with inhalation using difusser for 30 minutes. The 3rd group received combination of both massage and aromatheraphy for 45 - 50 minutes. The treatment performed twice i.e 3^{rd} and 4^{th} day of postpartum. The control group did not receive any treatment.

2.4. Data analysis

SPSS for Windows version 14 (SPSS Inc, Chicago, Illinois) was used for inputting, processing, and analyzing the data used in the study. Data analysis using Chi Square test, Pearson correlation, Paired Sample Test and One way ANOVA test.

3. RESULT AND DISCUSSION

3.1. Characteristics of respondents

The vast majority of respondents were 20-30 years old. There was no differences ages in all groups with *p-value* 0.558 (*p-value*> 0.05). In terms of educational attainment, most of respondents in all groups (72, 63, 81, and 72 percent respectively) completed secondary education.

Table 1. Correlation between Breastfeeding Frequency and *Body Mass Index* (BMI) with Breastmilk Production on Primaparous Postpartum Women in Semarang

Variable		Experiment				*p value*	Correlation 2 variable	
		Massage n=11	Aromatherapy n=11	Aromatherapy Massage n=11	Control n=11		R	*p value*
Breast-feeding Frequency	7 x	3	4	3	3	0.887[a]	- 0.106[b]	0.493[b]
	8 x	7	7	7	8			
	9 x	1	0	1	0			
BMI	Mean	23.01	23.26	22.1	22.93	0.456[a]	0.178[b]	0.248[b]
	SD	4.33	3.64	4.49	4.39			
	Min - maks	18-31	18-30	20-32	15-32			

a.Chi Square b. Pearson Correlation

3.2. Correlation between Breastmilk Production with Breastfeeding Frequency and BMI on Primaparous Postpartum Women

Most mothers in all groups breastfed their babies frequently. Table 1 shows that the majority of breastfeeding frequency was 8 times/day. There is no significant difference in the frequency of breastfeeding in all four groups with *p-value* = 0.887. Likewise, correlation Pearson also showed there was no significant association between the frequency of breastfeeding and milk production in this study with *p-value* = 0.493. Breastfeeding frequency related to the ability of hormonal stimulation in the mammary gland. The more the baby suckles at the breast, it will stimulate the release of hormones prolactin and oxytocin. In the event of a decrease in prolactin levels due to reduced stimulation of breast feeding by sucking infant, breastfeeding frequency is reduced, and the short duration of breast-feeding may result in reduced expenditure on milk. So it is important for mothers to breastfeed their babies as often as possible in both breasts alternately until the breast is emptied (Roesli, 2008)

The mean Body Mass Index (BMI) of all mothers in all group was relatively similar, ranged from 22.1 to 23.26 with the highest mean BMI on the second group. Statistical test also found there is no significant association between breastmilk production and BMI. Scientific studies prove that even with marginal nutritional status of the mother, the quantity of milk produced can meet the needs of the baby. Anthropometric data itself, such as BMI, it will usually affect the weight of the baby will be born, but it has nothing to do with milk production. Therefore, even when breastfeeding mothers are underweight, normal, or "overweight" they do not really need to worry about the volume of production of milk produced (Fadri, 2008).

3.3. Mean differences of cortisol levels before and after treatment

In the 1st group (massage), the average levels of cortisol was decreased from 185.36 ng/mL to 110.55 ng/mL after the treatment. With the average difference of cortisol level counted for 74.82 ng/ mL and *p-value* = 0.004, this study indicates that massage can decreased cortisol level of postpartum women. Likewise, in the second group (aromatheraphy), the cortisol level was decreased into 115 ng/mL from 168.18 ng/mL. In the third group (combination of massage and aromatherapy), the cortisol level decreased from 128.36 ng/mL to 97.9 ng/mL with the average difference about 35.30 ng/mL before and after treatment. Surpisingly, the average levels of cortisol in the control group also decreased from 215.36 ng/mL to 173.27 ng mL, although not statistically significant at *p-value* = 0,118.

Table 2 shows that the highest decrease in cortisol level was occured among the massage group (74.82 ng/mL), followed by aromatherapy group (53.18 ng/mL) and then combination massage and aromatheraphy group (35.30 ng/mL). This implied that massage only can decreased cortisol level more than aromatheraphy or a combination massage with aromatheraphy.

The findings of the present study is consistent with the previous ones. It has been proven that gentle massage can reduce cortisol by 28 per cent in depression postpartum (Ji Wu, 2014). Giving gentle massage effectively can also cut stress levels. After massage therapy, cortisol level normally will be decreased up to one third. Massage may also reduce adrenocorticotropic hormone (ACTH) which inhibiting secretions of cortisol stress hormone (Morhenn et al, 2012).

Table 2. Comparison and Mean Differences of Cortisol Level and Breastmilk Production Before and After Treatment

		Group				
		Massage	Aromatherapy	Massage Aromatherapy	Control	*p value*
Cortisol (ng/mL)	Mean Pre	185,36	168,18	128,36	215,36	
	Mean Post	110,55	115,00	97,90	173,27	
	Mean Post-Pre	74,82	53,18	35,30	42,09	
	SD	65,75	37,63	13,49	81,58	
	p value	0,011[c]	0,001[c]	0,000[c]	0,118[c]	
	Mean Difference before treatment					0,243[d]
	Mean	185,36	168,18	128,36	215,36	
	SD	89,34	80,82	50,58	151,43	
	Min- maks	79 – 348	70-305	78-220	53-557	
	Mean Difference after treatment					0,047[d]
	Mean	110,55	115,00	97,90	173,27	
	SD	41,3	53,37	42,37	100,43	
	Min- maks	66 – 188	60 – 220	59 – 179	53 – 418	
Breastmilk production (ml)	Mean Pre	93,18	94,64	97,09	96,55	
	Mean Post	172,18	166,36	190,00	131,82	
	Mean Post-Pre	-79,00	-71,73	-95,100	-35,27	
	SD	11,54	20,79	21,87	23,82	
	p value	0,000[c]	0,000[c]	0,000[c]	0,001[c]	
	Mean Difference before treatment					0,930[d]
	Mean	93,18	94,64	97,09	96,55	
	SD	12,18	13,64	14,07	20,55	
	Min- maks	72-109	72-114	78-119	72-140	
	Mean Difference after treatment					0,000[d]
	Mean	172,18	166,36	190,00	131,82	
	SD	12,40	16,85	20,94	25,34	
	Min- maks	156-192	140 -197	156-213	98-176	

c Paired Sample Test One Way Anova

In all group, there is no significant difference of cortisol levels before treatment in all groups with *p value* = 0.243 (*p value*> 0.05). Likewise, there was also no significant difference in cortisol levels after treatment in all groups with p value = 0.047 (*p value*<0.05).

3.4. Comparison of breastmilk production before and after treatment

When the cortisol level decreased, breastmilk production was increased. In the massage group, the treatment elevated breastmilk production from 93.18 ml to 172.18 ml, whilst in aromatheraphy massage was increased from 94.64 ml to 166.36 ml. The highest increased was occured in the combination massage and aromatheraphy group, from 97.09 ml to 190.00 ml. Statistics test result also confirmed that in three intervention groups, there were a significant difference in the mean breastmilk production after the intervention given. Nevertheless, the breastmilk production in the control group was also increased from 96.55 ml to 131.82 ml and statistically significant with p-value 0.001.

The findings showed that there are significant differences in the average milk production before and after in all groups with an average increase in the group of massage, aromatheraphy and aromatheraphy massage with 79 ml, 71.73 ml and 95.10 ml respectively.

Although there was a signifcant difference of breastmik production before and after the treatment in all groups, nevetherless, when the comparison was made between groups, there was no significant differences in breastmilk production before treatment in all groups. However, there was a significant difference in breastmilk production after treatment in all groups with *p value* = 0.000 (*p value*<0.005)

The results indicate that the massage has an effect on cortisol levels of primiparous postpartum women in Semarang. The results are consistent with studies on women in Korea who were given massage for 15 minutes and experienced a decrease in cortisol levels of 4.7 ng/mL (Ji Wu, 2014). Massage is the manipulation of the soft tissue structures that can soothe and reduce psychological stress by increasing the morphine endogenous hormones such as endorphins, enkephalins and dynorphin while lowering levels of stress hormones such as cortisol, norepinephrine and dopamine (Best et al, 2008). Gentle massage can reduce cortisol by 28% in depression and also reduce the level of stress of postpartum women (Ji Wu, 2014). It's also have been well-known that massage can reduce adrenocorticotropin hormone (ACTH) (Morhenn et al, 2012).

This study also proves that there are effects of aromatherapy on primiparous postpartum maternal cortisol levels. When we inhale a smell, its chemical components will fit into the *olfactory bulb*, then to the *limbic system* of the brain. *Limbic system* as central pain, pleasure, anger, fear, depression, and various other emotions. *Limbic system* receives all information from the auditory system, the visual system, and the olfactory system. This system can also control and regulate body temperature, hunger and thirst. *Amygdala* as part of the *limbic system* is responsible for our emotional responses to scent. *Hippocampus* is responsible for memory and recognition of smell is also a place where chemicals in stimulating aromatherapy storehouses of our brain's memory to the introduction of smells (Buckle, 2001).

Jasmine essential oils stimulate the body to release endorphins which are natural pain killers and mood enhancer (Swati et al, 2013), thus making the body becomes relaxed. Results of this study indicate that there are effects of aromatherapy massage on levels of cortisol in the mother postpartum primiparous. The results showed there was no difference in cortisol levels before treatment in all four groups with p-*value* = 0.243 (*p value*> 0.05), but there are significant difference in cortisol levels after treatment with *p-value* = 0.047 (*p value*<0.05).

Aromatherapy massage is proven to be an effective method to reduce tension because the effect of three channels simultaneously affect body system through inhalation, application of aromatherapy and massage mechanism. Giving aromatherapy by topical will work on the body through a mechanism that relies on a system neuromuscular massage given nerves (Koesoemardiyah, 2009; Primadiati, 2002). Massage can loosen the muscles and tissues are clogged. Nerve ends will also hold communication with organs in the body to produce the effect of stimulation or relaxation depending essential oils used (Deveraux, 2003).

These results indicate that the massage effect on milk production in postpartum primiparous mothers. Massage can give the sensation of relaxation in the mother and flow nerves and milk ducts both breast (Perinasia, 2011). Massage also can provide comfort and relax the mother because massage can stimulate endorphin secretion and stimulates oxytocin reflex (Saleha, 2009).

The present study also confirmed the consistent effect of aromatherapy on primiparous postpartum maternal breastmilk production. Honarvar et al (2013) study on 46 nursing mothers reported that fennel increase serum prolactin in the blood after administration of intervention for 15

days with an average increase in 31.00 ng / mL. Jasmine aromatheraphy can also increase breastmilk production so it is good for the breastfeeding women (Swati et al, 2013).

The results showed that there are significant aromatherapy massage on breastmilk production on primiparous postpartum women in Semarang. The increase in breastmilk production is found in all groups of both the treatment group and the control group. This is consistent with the theory that, the first and second day since birth, milk production was only around 50 -100 ml. The amount was increased to 500 ml in the second week. Milk production more effective and continue increased in 10-14 days after birth (Prasetyono, 2009). With given treatment massages, aromatherapy or a combination of both, the breastmilk production has increased more than the control group.

4. CONCLUSION AND RECOMMENDATION

The study found, there was an effect of massage, aromatheraphy and aromatherapy massage on the level of cortisol of the primiparaous postpartum women. The cortisol levels in primiparaous postpartum women who receive treatment massage, aromatherapy, aromatherapy massage and control group was significanly different before and after the treatment. Likewise, Massage, aromatheraphy and aromatheraphy massage also found to affect breastmilk production in all intervention groups. Therefore, it is recommended to provide aromatherapy massages service in the early postpartum to increase breastmilk production and also using aromatherapy massage therapy as alternative solutions to solve the problems, especially for women who experience anxiety and emotional stress and disturbance in the production of breastmilk

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